New York State Technology Enterprise Corporation

presents its

Geographic and Demographic Assessment of Tompkins County Report

for the

Tompkins County Radio System Project

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Version 1

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Tompkins County Radio System Project

1. INTRODUCTION

This report presents the geophysical and demographic features of Tompkins County as they relate to the radio communication environment, specifically to the needs of public-sector radio communication. Issues such as topography, land use/land cover, and existing unique communications areas are identified and discussed as they may affect subsequent communications analyses. Lastly, this report presents various figures, GIS based, to gain insight into Tompkins County's unique geologic, demographic, and radio communications environment.

Tompkins County is 476 square miles in area, with a population of slightly less than 100,000 people. It is a largely rural county that includes 16 municipalities, with one-third of its population in the only city in the county, Ithaca. Cornell University and Ithaca College are situated in the Town of Ithaca and the City of Ithaca, and add to the population in the City of Ithaca. Population centers in the rest of the rural county townships include the Villages of Trumansburg, Groton, Dryden, Cayuga Heights, and Freeville. Using this demographic information, NYSTEC examined and discussed critical areas of concern and population density as they relate to RF and LMR systems designs and public safety. Tompkins County has a topographic relief of 1717 feet from its highest feature, Connecticut Hill (2009 feet above sea level, ASL), to the surface of Cayuga Lake (382 feet ASL), and is renowned for its deep glacial gorges and situation at the Southern end of Cayuga Lake. While significantly decreased in acreage since the county's establishment in 1817, farms still occupy 30% of the county's total land. Figure 1 shows the overall topography of Tompkins County and its major roads and municipal boundaries.

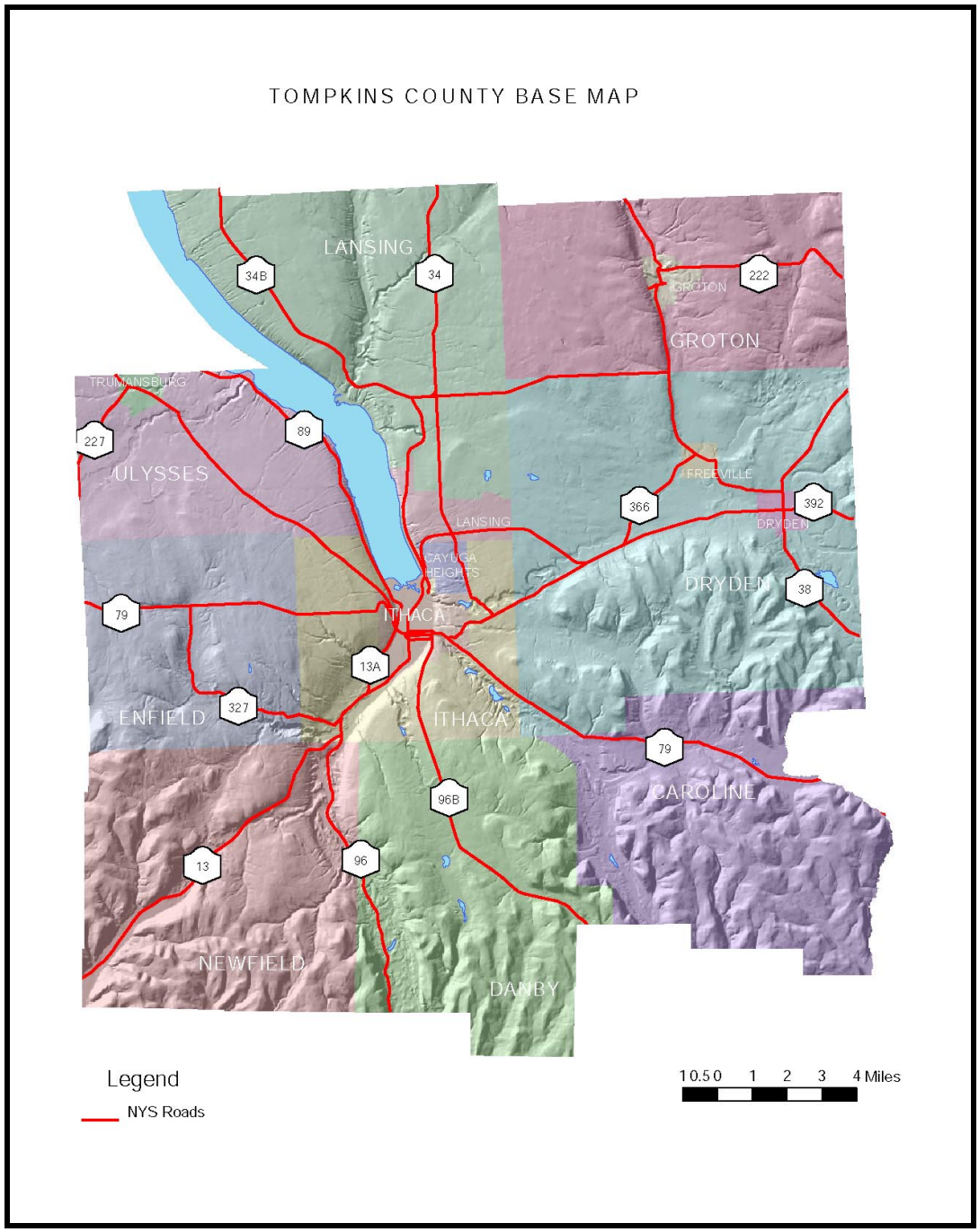

Figure 1, Tompkins County Base Map

The Tompkins County land-use/land-cover (LU/LC) data consisted of very unique and well-developed data sets that indicated very well the County's unique diversity. These enhanced LU/LC classifications mapped into the TIA/EIA TSB88-A much more readily because there was more definition available, making the TIA clutter class more exact than being based on USGS alone. The TIA data sets derived from the Tompkins data sets are more spatially and temporally accurate, as well as categorically more accurate than other sources, such as USGS.

2. PHYSICAL GEOGRAPHY AND DEMOGRAPHICS

This section reviews the physical geography and demographics of the Tompkins County area, as well as other considerations that could have impact on radio propagation.

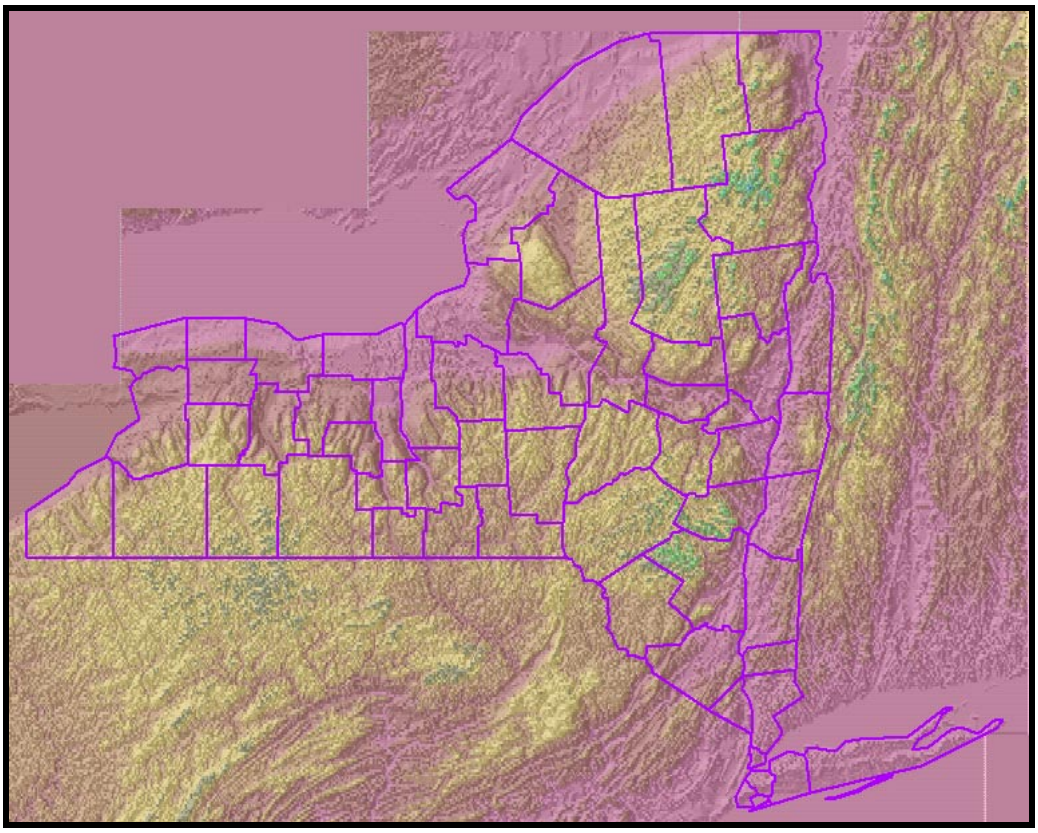

Figure 2, New York State Terrain Profile

2.1 Applicable New York State Geography

2.1.1 Appalachian Upland and Finger Lakes Region

Occupying nearly half the state, the Appalachian Upland is the largest of the land-form regions in New York (see green area in Figure 3). It runs just south of the Thruway (from five to 10 miles south of the Thruway at various points) down to the Pennsylvania border. It encompasses the Catskills Mountains in the southeast and all of the Southern Tier over to Chatauqua County in the southwest. This entire area is underlain with sedimentary rocks dipping slightly to the south and west. All but the extreme southwest was buried under glaciers; and the land here is deeply scoured. Around the northern and eastern margins, a series of resistant beds form conspicuous escarpments, the most noted of which is the Helderburg Escarpment southwest of Albany.

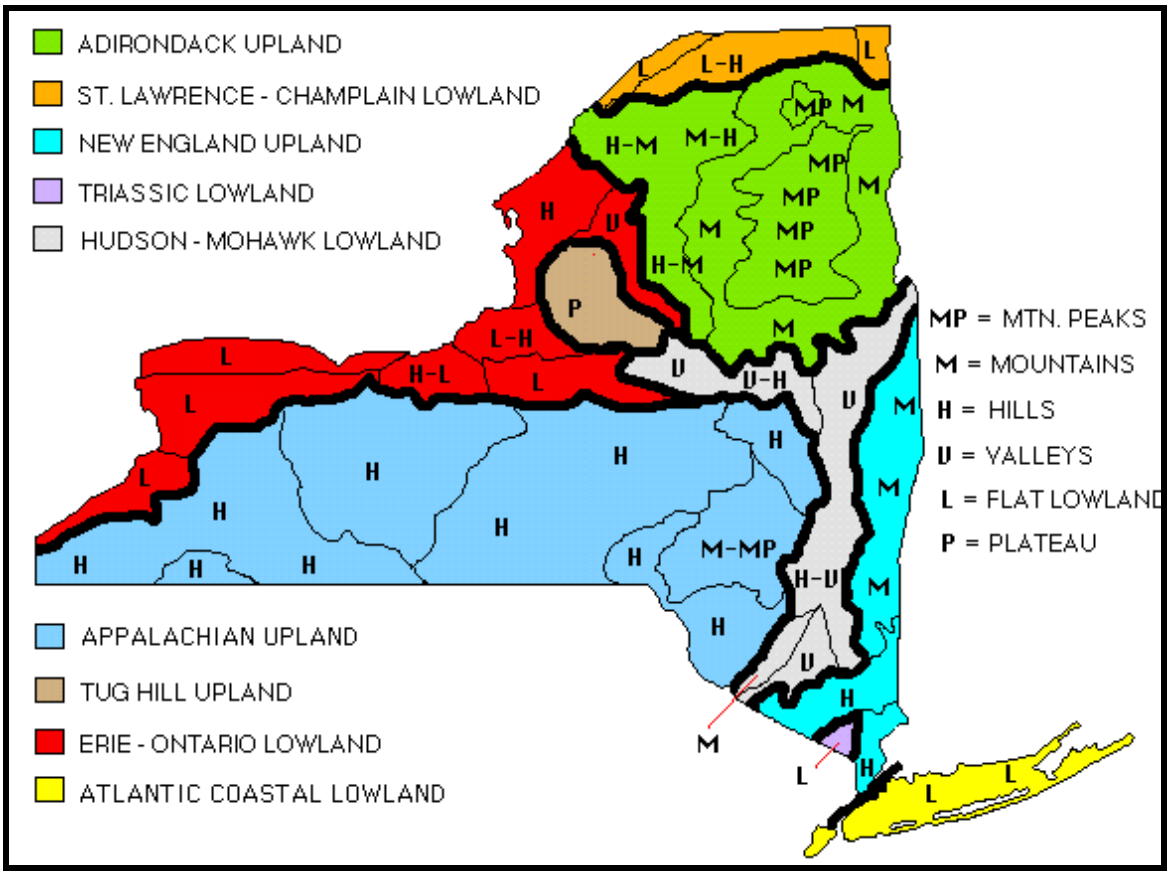

Figure 3. New York Land-Form Regions

2.1.2 Iron Ore Considerations

The general RF view of iron in New York State and its impact on propagation is that it is a small factor. Clearly there are some instances (particularly the Adirondack Upland) where iron deposits will impact RF propagation and should be considered in modeling. The impact of iron ore on propagation on modeling results in allowing for changes in dialectic constants and soil conductivity.[1] Iron Ore interference with RF propagation is not an issue in Tompkins County.

For reference, the chart on the below lists the known iron deposits around the state. This is detailed here to indicate that the County is not in an area where the consideration of iron ore concentrations have an impact on radio propagation.

[1] This is seen in the A. G. Longley & P. L. Rice model. This model is can be reviewed in National Bureau of Standards (NBS) Tech Note 101.

Table 1: Iron Ore Deposits In New York State

County	Exact Location	Mineral
Cayuga	Near Wayne County border, Duck Lake area	hematite
Clinton	Arnold Chategaugay Numerous other locations	magnetite magnetite all
Columbia	Eastern portion	siderite
Dutchess	Throughout	siderite
Erie	Eight Mile Creek	pyrite
Essex	Bear Pond Burton Hill Numerous other locations	pyrite magnetite magnetite all
Jefferson	Philadelphia Numerous other locations	hematite, siderite, pyrite all
Putnam	Pine Pond Brewster Numerous other locations	pyrite, iron diarsenide hematite, magnetite all
Oneida	Small abandoned mine, location unknown	hematite
Orange	Numerous locations near NJ border	magnetite, hematite
St. Lawrence	Fowler Gouverneur Herman Star Lake Numerous other locations	hematite pyrite pyrite magnetite all
Ulster	Napanock	siderite
Wayne	Near Cayuga County border, Duck Lake area	hematite

2.2 Tompkins County Physiography and Geology

Tompkins County exists in a humid, continental type climate, and lies physically within the Allegheny Plateau segment of the Appalachian Plateau Physiographic Province, except for the Cayuga Lake Valley, which is in the Erie-Ontario Plain Province. The county exhibits features that reflect its glacial and fluvial history, including significant topographic variable between the northern and southern portions of the county. The northern portion of the county's low relief is a relic of the extent of the glacial advance, while the southern quarter of the county exhibits rough, well dissected, mature drainage. The bedrock underlying the county consist mainly of Devonian age sedimentary rocks, including shale, fine-grain sandstone, and bedded limestone. This bedrock is relatively undisturbed tectonically, with a gentle south-southwest dip and virtually no folding or faulting present. The surficial geology of the county consists predominantly of glacial out-wash, till, morraine, and lucustrine sediments mantling the bedrock. The northern three-quarters of the county drains north into the St. Lawrence river basin, while the southern-most streams feed the Susquehanna drainage system.

Due to the lack of iron ores in either the surficial or bedrock geology in the county, the physiography plays the most important factor in radio propagation in this county. Gorges and steep ravines are found throughout the county, as are waterfalls. Significant topographic

disparity exists between northern and southern Tompkins County, and will be briefly examined in the following paragraphs.

A well-dissected high plateau characterizes the southern portion of the county (towns of Danby, Caroline, Newfield, and the south half of Dryden), with generally rough terrain between the broad stream valleys. Elevation in this region is roughly 1,500 – 2,000 feet. This portion of the county has a large amount of high slope (>20 degrees), concentrated in the drainage systems between the large, broad valleys. The Central portion of the county (Towns of Enfield, Ithaca, central Dryden, City of Ithaca, and villages of Lansing, Cayuga Heights, Dryden and Freeville) is dominated between the transition from the high relief, rough terrain of Southern portion of the county and the low-relief northern plateau. The topography is less rough than the southern section, with more confined and higher sloped, narrow valleys feeding Cayuga lake. The City of Ithaca is located mostly in the Cayuga Lake valley. Extreme topographic conditions exist within the Cayuga Lake valley, especially the valley slopes, as exemplified in western boundary of the village of Cayuga Heights.

The Northern portion of the county has less overall roughness than the southern portion. Northern Tompkins County contains several deep valleys that contribute to the physiographic complexity of the county, including hanging valleys of 100 feet or more along the Cayuga lakeshore from contributing streams. These deeply incised valleys that flow into Cayuga Lake are prominent in the Village of Trumansburg, and in the Towns of northern Ulysses and Lansing. The village of Groton lays entirely within steep sloped valleys that feed in to Owasco Inlet. The could be of importance to radio propagation. For example the village of Groton lies almost completely in a basin of an area that is surrounded by terrain with slope greater than or equal to 20 degrees from the horizontal. The way in which antennas and siting are determined *could* be based on illuminating this area along the north-to-south valley basin corridor.

2.3 Tompkins County Demographics

Tompkins County is comprised of 9 towns, 6 villages, and one city. The towns are Lansing, Groton, Ulysses, Ithaca, Dryden, Newfield, Enfield, Danby, and Caroline; the villages are Groton, Trumansburg, Lansing, Freeville, Cayuga Heights, and Dryden; the city is Ithaca. Figure 4 shows the population distribution by municipality as of the 1990 census. Residential concentration is heaviest in the city of Ithaca and the villages within the county. It is important to note that the city of Ithaca is the center of population for the county, while the villages are the population centers for their respective townships. Land use in this county is predominately forest and agricultural.

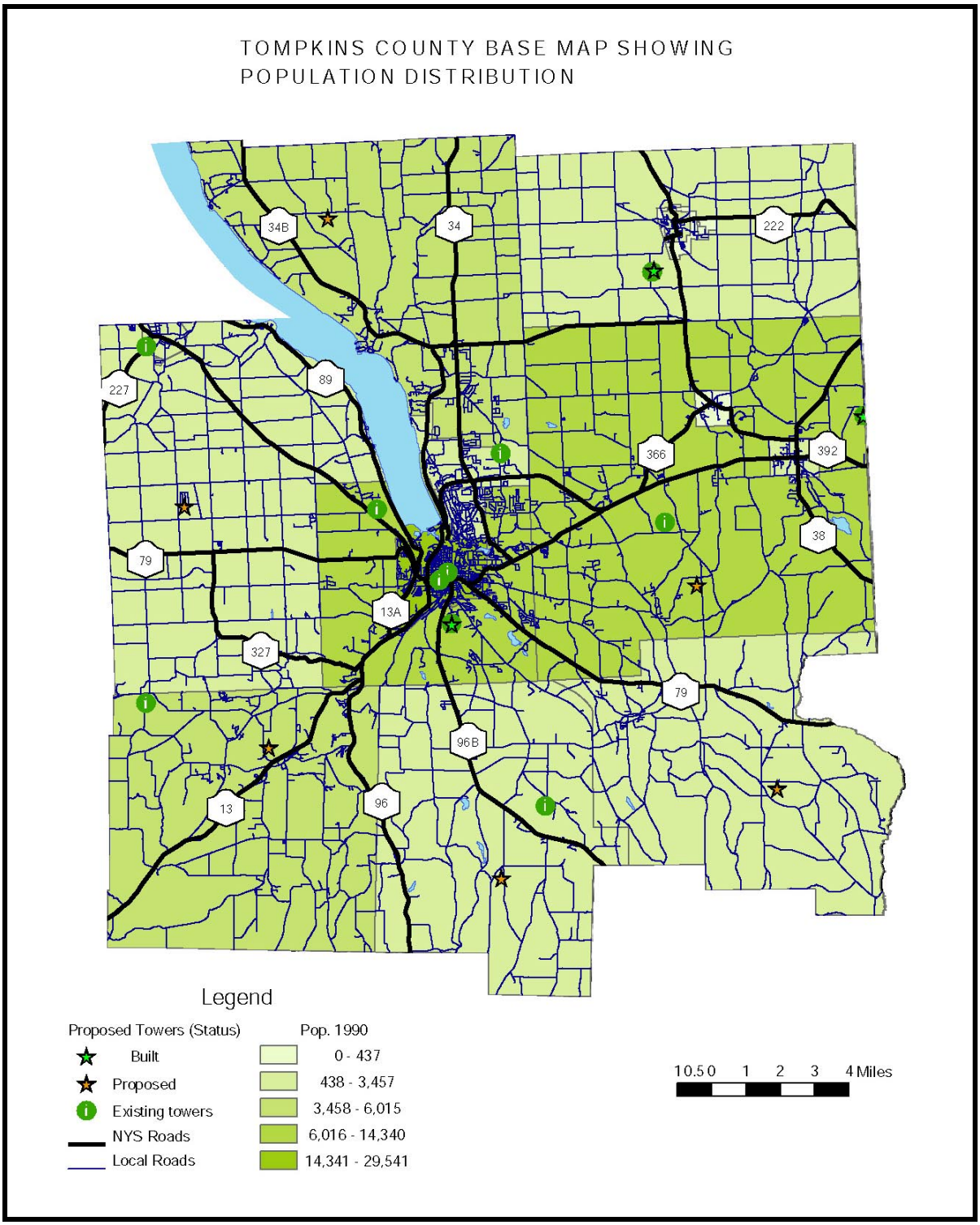

Figure 4, Population (1990) by Municipality

2.4 Tompkins County Land Use

The Telecommunications Industry Association (TIA) is the leading trade association in the communications and information technology industry. It has marketing interests in development, trade promotion, and trade shows — with domestic and international efforts in standards development. This association provides a market-focused forum for more than 1,100 member companies that manufacture or supply products and services used in global communications.

TIA represents providers of communications and information technology products and services for a global marketplace through its core competencies in standards development, as well as domestic and international advocacy, market development, and trade-promotion programs. This association facilitates the convergence of new communications networks while working for a competitive and innovative market environment. Through the use of its publications, various interests can find common grounds for technological development through TIA's standards efforts and the various forums that it supports. This not-for-profit body, through the publication of its Telecommunications Systems Bulletins (TSBs) has, for some time, been involved in an effort to define the radio-coverage methodologies through the work of various telecommunications committees made up of industry, users, and systems owners. A TSB is not a standard, but, rather, contains technical material that may have value to industry and users. Of most concern here is the work of TSB88-A, *Wireless Communications Systems - Performance in Noise and Interference-Limited Situations - Recommended Methods for Technology-Independent Modeling, Simulation, and Verification*, Committee: TR-8.18, published June 1, 1999.

The purpose of TSB88-A in particular is to offer guidance in:

- establishment of standardized methodology for modeling and simulating narrowband/bandwidth-efficient technologies operating in a post "refarming" environment;
- establishment of a standardized methodology for empirically confirming the performance of narrowband/bandwidth-efficient systems operating in a post "refarming" environment; and
- aggregating the modeling, simulation, and empirical performance-verification reports into a unified "spectrum-management toolkit" that may be employed by frequency coordinators, systems engineers, and system operators.

The main purpose of this document is to define and advance a scientifically sound standardized methodology for addressing the areas. TSB88-A provides a formal structure and quantitative technical parameters from which automated design and spectrum-management tools can be developed. Within this document, USGS land-use and land-cover classifications are truncated down, because contributing academics and commercial interests have agreed (through the TIA process) to lower the number of LU/LC categories (because the loss values were determined to be the same and, therefore, in the coverage-modeling aspect, fewer categories were needed).

This truncation will explain differences in the Tompkins County GIS data of land categories and the TIA TSB88-A reported amounts for categories with the same or similar nomenclature.

The Tompkins County land-use and land-cover (LU/LC) data consisted of very unique and well-developed data sets that indicated the County's unique diversity very well. These enhanced

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LU/LC classifications, based on Tompkins County data, were used in the truncation required by the TIA/EIA TSB88-A. Because there was more definition available in the Tompkins County data than that available in the USGS data, the resulting TIA clutter class was more detailed than it would have been based solely on USGS data. The TIA data sets derived from the Tompkins data sets are more spatially and temporally accurate, as well as categorically more accurate, than other sources, such as USGS.

The detailed Tompkins County LU/LC was truncated down to fit the categories in this Telecommunications Systems Bulletin (TSB). The details of this truncation are noted in Tables 2 and 3 below. Figures 5 and 6 both depict Land Use for Tompkins County. Figure 5 shows the Land Use as Tompkins County defined superclasses. These Land-Use superclasses were derived from the 63 classes in the Land-Use data set provided by the county. Each of these 63 classes is identified by a 2- or 3-letter code — the first letter indicating the general land use, and the following letter(s) specifying the class in more detail. Figure 6 represents the Land Use as classified using the TIA-TSB 88-A standards for Clutter Classification. Each of the 63 classes was assigned a Clutter Class number (1-10) indicating a specific Clutter Class. The data was then summarized, and Figure 6 shows the results of this classification. These two tables show the approximate percent area of the county occupied by each of the Land Use Classifications. Table 2 shows the Land-Use-percent area by the 9 TIA-TSB Clutter Classes, and Table 3 shows Land Use by the 10 Tompkins County classification based superclasses.

Table 2, TIA-TSB Clutter Classes by Percent Area

Clutter Class	Description	% Area
5	Forest Land	47.0%
1	Open Land	29.9%
3	Rangeland	9.2%
7	Residential	4.9%
4	Water	3.4%
8	Mixed Urban	2.5%
6	Wetland	1.3%
9	Commercial/Industrial	0.9%
2	Agricultural	0.9%

Table 3, Tompkins County Land-Use-Classification-Based Superclasses by Percent Area

Superclass	Description	% Area
F	Forest	53.5%
A	Agriculture	30.4%
R	Residential	6.8%
W	Water/Wetland	6.4%
O	Recreational	0.7%
P	Public	0.6%
I	Industrial	0.5%
C	Commercial	0.4%
D	Idle/Barren/Disturbed Land	0.4%
T	Transportation	0.2%

As Figure 5 indicates, the bulk of the agricultural areas are in the northern plateau region, and the large areas of contiguous forest are in the southern uplands. The remaining residential areas are concentrated along the state and local roads. Industry, and industrial zoning is readily found in the city of Ithaca and two neighboring villages of Cayuga and Ithaca Heights.

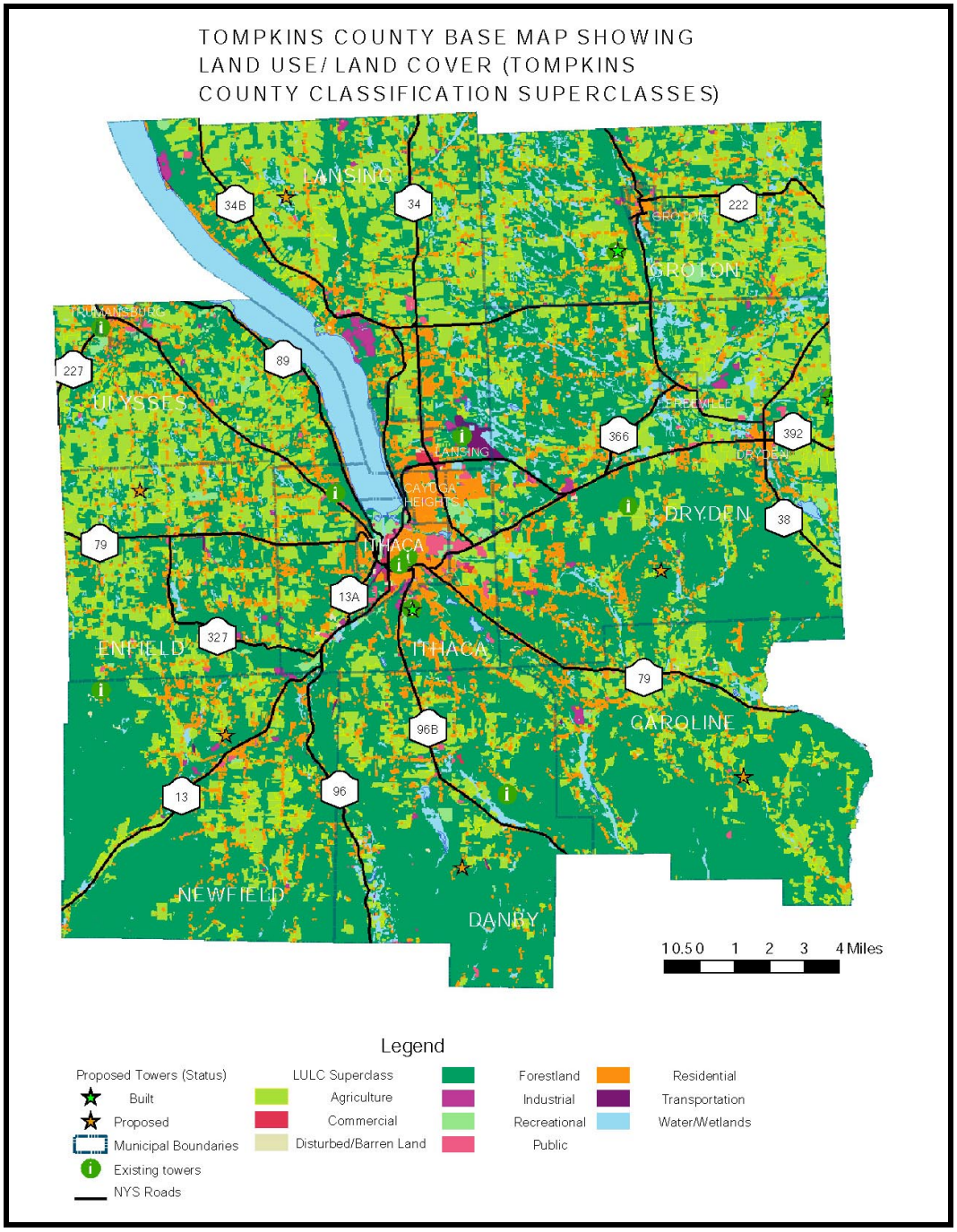

Figure 5, Tompkins County Land Use by Superclass

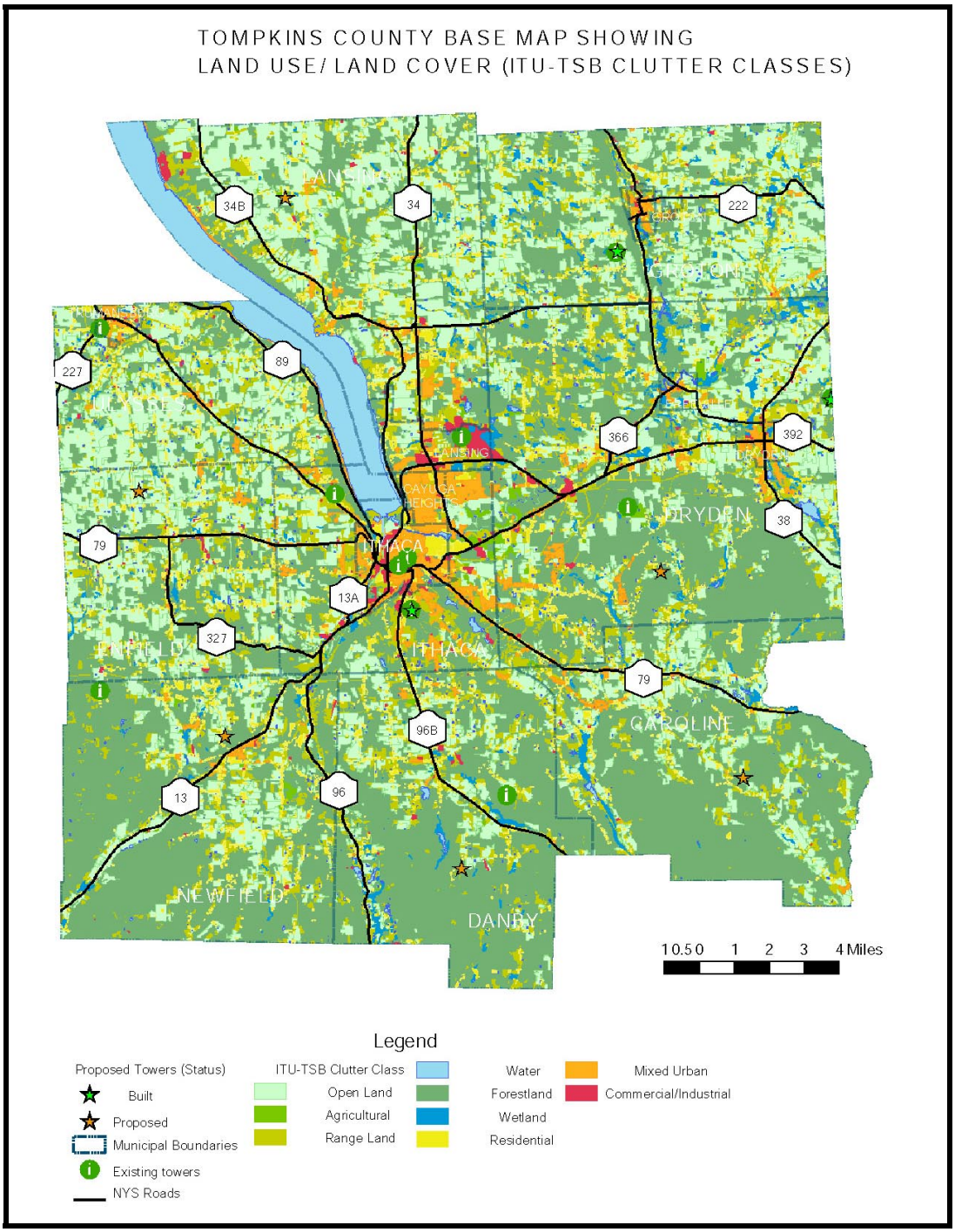

Figure 6, Tompkins County Land Use By TIA-TSB 88-A Clutter Classes

3. PHYSIOGRAPHY-RELATED RADIO COMMUNICATION ISSUES

The bulk of the physiography-related radio issues stem from the disparity in topography in the northern and southern sections of the county. The unique physiography-related issues that exist in Tompkins County are explored here.

In the figures that follow in this section, the proposed Motorola siting is included for the convenience of the reader. This section *does not* include (nor does any of this report) any radio-propagation maps. This report is dedicated strictly to finding the unique geographical areas and land types that are unique to Tompkins County and that *could* be of concern to radio propagation. Figure 7 shows the currently reported radio-coverage problem areas. These areas were derived from an annotated map collected during the interview task for Tompkins County. These coverage problem areas are spread evenly throughout the county, with a tendency towards the areas of within the broad-floored valleys, especially along the roads within these valleys.

The areas that represent the most challenges in terms of radio coverage are termed 'Aggressive Terrain' Areas. These areas correspond to the areas of the valleys (for all three portions of the county) and the areas of slope greater than 20° from the horizontal. A valley is determined by the connecting contour that is the base of an area that is at the lowest elevation of a 20° elevation slope (see Figure 8). These areas of aggressive terrain are a warning sign to radio siting. These areas indicate possible challenging terrain to illuminate by radio hilltop siting. Not all these areas will prove challenging, but some will almost certainly be areas shadowed or blocked by hilltop siting. It is important to make clear that not all of these areas represent shadowed areas and that this study is not a radio-coverage study. This study is concerned with the findings for the geophysical reality of Tompkins County. In terms of the geophysical reality of Tompkins County, the areas of slope greater than 20° from the horizontal are considered to be of special interest. Some part of this total area may well prove to be challenging for provision of radio coverage by conventional hilltop siting.

The proposed site locations are located on the higher elevations in the Towns of Lansing, Enfield, Newfield, Danby, Dryden, and Caroline. Line-of-sight (LOS) analysis was conducted using the NYSDEC 10-meter DEM for NYS and the proposed tower locations, elevations, and antenna heights. This analysis was conducted to give a nominal view of the terrain within the line of sight of the proposed tower locations for the entire county. This can be important for the review of the proposed siting, because it is a high-level indication of which areas depend on non-line-of-sight or refracted RF illumination. Caution is again given in that the LOS depictions are not radio-coverage maps. These depictions considered with the areas of aggressive terrain may give some indication of the amount of the County that may be shadowed or fully reliant on RF reflection. This LOS depiction may indicate what areas may well be challenging to illuminate by hilltop. These maps also aid in understanding where these areas are populated and/or have roads. Figure 9shows the results of this analysis, with the terrain visible from at least one of the tower locations in green and the terrain not visible from any of the tower sites in red.

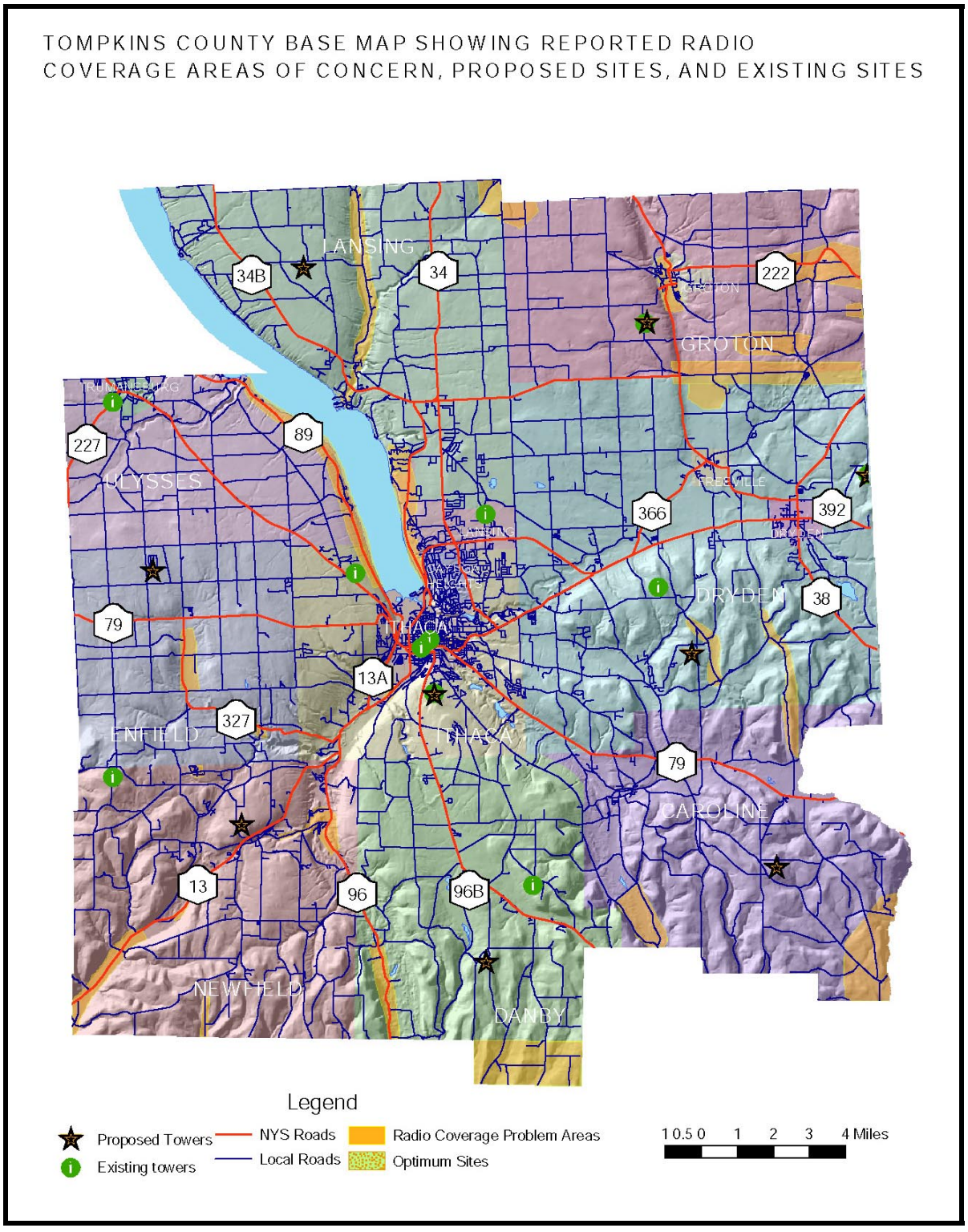

Figure 7, Areas of Most Concern, Shown in Orange

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3.1 Areas of Most Concern

Areas of Most Concern are areas that Tompkins public-safety users identified as problem areas that exist today. These problem areas are high level and representations only. These are areas that users marked up on a map during interviews or where large areas were repeatedly mentioned in the surveys that NYSTEC conducted. The map in Figure 7 has the existing tower locations detailed on it. These areas are also overlaid on the terrain to better illustrate location and as an aid as to why they may be troublesome.

It is interesting to compare Figure 7 with Figure 8, which shows areas of aggressive terrain. Many of these reported coverage areas correspond with areas of aggressive terrain. Further, much of the detailed user reports of coverage problems reported (see Appendix C to the Task 1 *Public-Safety Communication Needs Analysis Report*) also correspond to areas of aggressive terrain.

3.2 Areas of Aggressive Terrain

Table 4 provides statistics for areas of aggressive terrain, by affected municipalities.

Table 4, Areas of Aggressive Terrain, by Municipality

Municipality	Population (1990)	Low Slope	Aggressive Terrain (miles^2)	Aggressive Terrain %	Total Area (miles^2)
Dryden	13251	47.0	44.1	48%	91.1
Newfield	4867	36.2	22.7	39%	58.9
Caroline	3044	33.7	21.3	39%	55.0
Lansing	9296	35.6	20.5	36%	56.1
Danby	2858	38.2	15.4	29%	53.6
Ithaca	17797	13.5	10.1	43%	23.6
Groton	5483	39.4	8.6	18%	48.0
Ulysses	4906	25.3	6.5	21%	31.8
Enfield	3054	31.0	5.9	16%	36.9
Ithaca (city)	29541	1.1	4.4	80%	5.5
Totals	**94097**	**301.0**	**159.5**		**460.5**

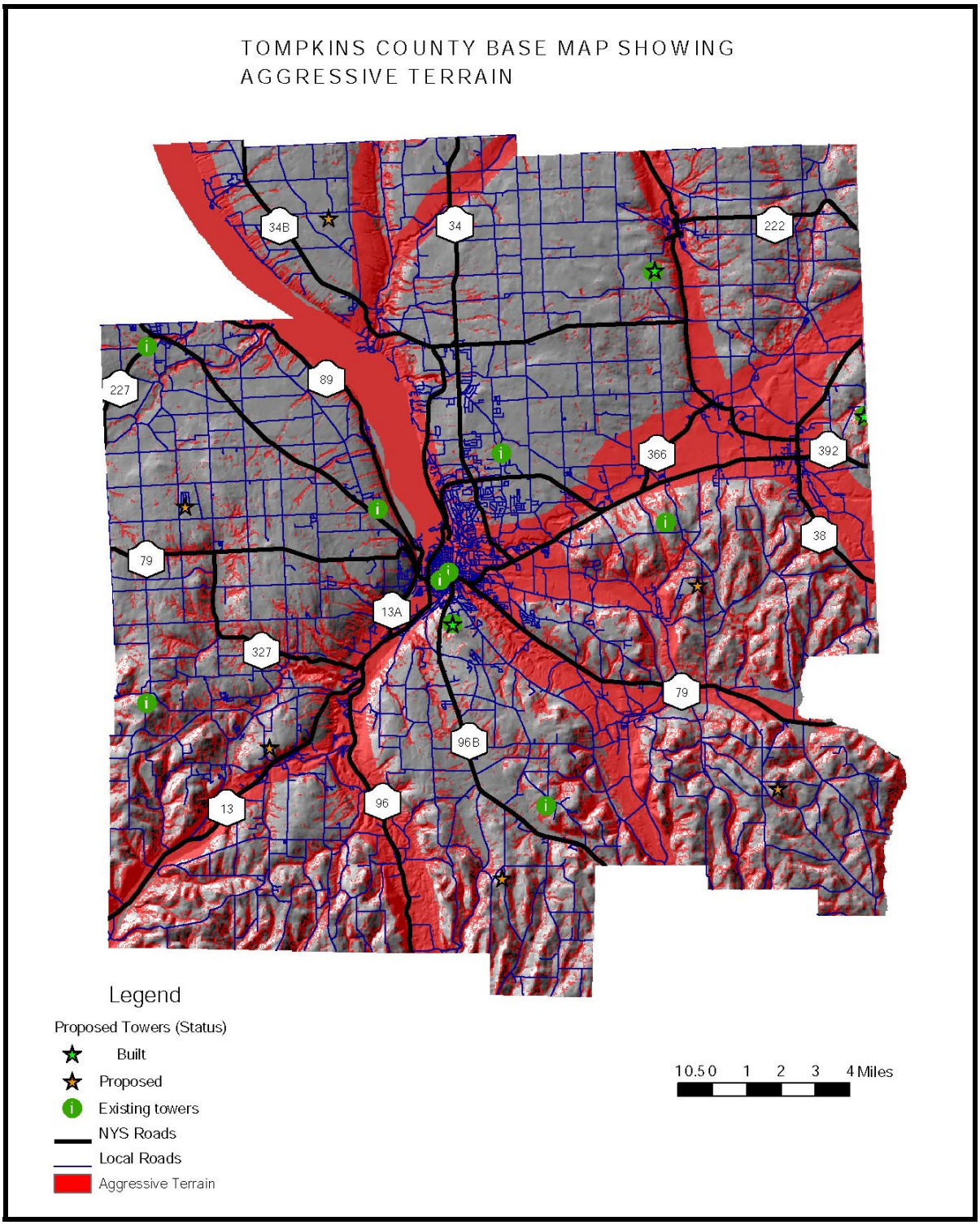

Figure 8, Areas of Aggressive Terrain

Figure 9 is a line-of-sight analysis, showing the areas that are illuminated (and those that are not illuminated) by six proposed radio sites.

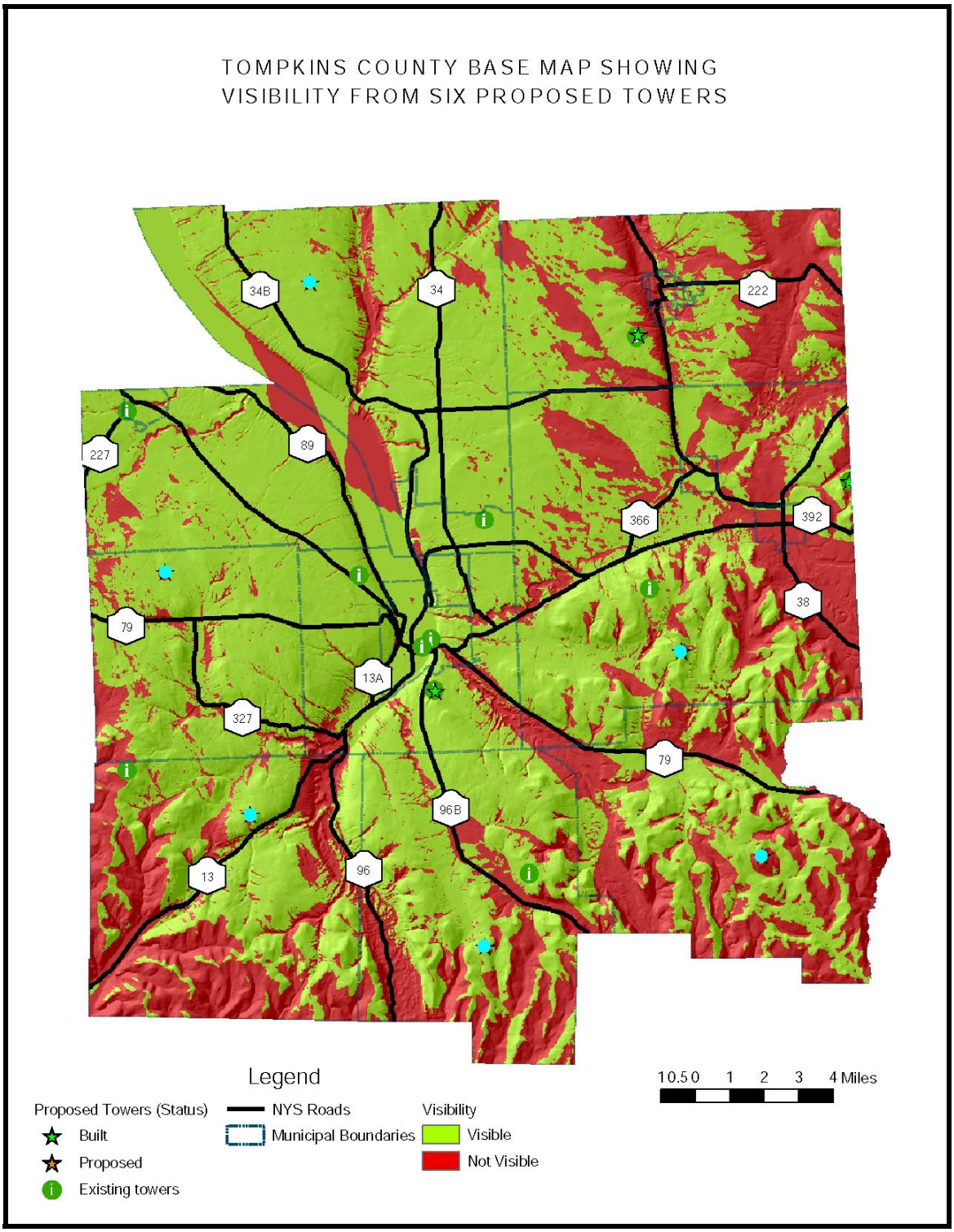

Figure 9, LOS Analysis for Six Proposed Tower Sites

Figure 10 shows three radio coverage zones overlaid on the Tompkins County base map.

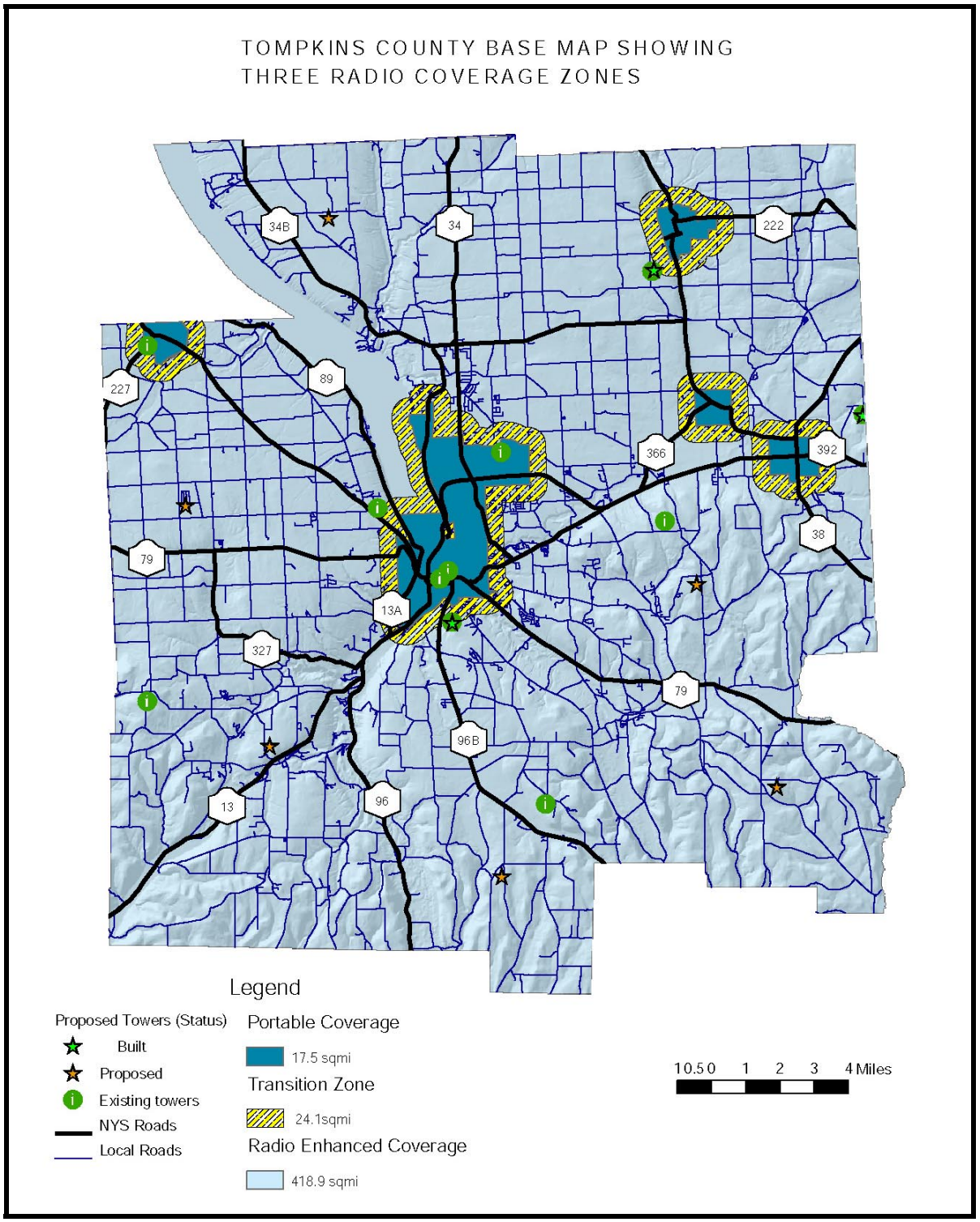

Figure 10, Three-Zone Coverage Map

The three radio zones illustrated here in Figure 10 are based both on these user needs and the County's physical geography and political boundaries. The reader is cautioned these are <u>not</u> radio-coverage maps. Figure 10 indicates three radio zones based on fundamental user

requirements (see Section 2.8 of the Task 3 "Options for a Public Safety Wireless Communications System: Synthesis and Evaluation Report"). Portable radio coverage is the most desired coverage type, as reported by the Tompkins County public-safety community (see Section 2.6.1 of the Task 1 "Public-Safety Communication Needs Analysis Report"). The three radio zones noted here are:

- Portable Coverage,
- Transition Zone Coverage, and
- Radio Enhanced Coverage.

Portable Coverage Zone and Transition Zone

The political boundaries are a reasonable depiction of the type of environment, urban or suburban, and, therefore, the portable coverage requirements for these areas are driven by the demographics. Given user input, these areas need siting that supports "on-the-hip" portable coverage. The Transition Zones are band of areas that are recommended to extend the "on-the-hip" portable coverage beyond the political boundary because of operational issues (e.g. interoperability with other agencies, incident command of fires near the city and town lines, as well as the pursuit of perpetrators). The Portable Coverage Zones are areas that may have commercial buildings with in-building coverage needs as well. The Portable Coverage Zone requires County, city, and town employees to be anywhere at any time inside the Zone with a portable only.

Radio Enhanced Coverage Zone

Based upon these user needs (again see Section 2.8 of the Task 3 "Options for a Public Safety Wireless Communications System: Synthesis and Evaluation Report"), the remaining area (which includes almost all of the area identified as aggressive terrain) requires portable coverage. This remaining area requires County and town employees to be *almost* anywhere at any time, often in suburban-type wooden structures and mainly near or on roadways. The reason this area is referred to as Radio Enhanced Coverage is driven by two principal reasons:

- given that this area has a large amount of aggressive terrain, hilltop siting alone will most likely not fully illuminate the entire Radio Enhanced Coverage Zone, and
- there are entire areas into which public-safety personnel rarely venture.

As such, it should be anticipated that communications provisioning into this zone *might* require some augmentation by the use of vehicular repeaters and tactical communications means. For example, vehicular repeaters could be used in agency vehicles to enhance coverage off roadside, and portable repeaters could be on call for incidents in gorges.

APPENDIX A, ACRONYMS

ASL	Above Sea Level
COTS	Commercial Off The Shelf
DEC	Department of Environmental Conservation
DEM	Digital Elevation Model
EIA	Electronic Industries Alliance
GIS	Geographic Information System
GIT	Geographic Information Technology
ITU	International Telecommunications Union
NYS	New York State
RF	Radio Frequency
TIA	Telecommunications Industry Association
TSB	Telecommunications Systems Bulletin

APPENDIX B, REFERENCES

United States Department of Agriculture, 1965, Soil Survey of Tompkins County NY, USDA, Washington DC

Telecommunications Industry Association, 1999, TIA/EIA Telecommunications Systems Bulletin: Wireless Communications Systems – Performance in Noise and Interference-Limited Situations – Recommended Methods for Technology-Independent Modeling, Simulation, and Verifications (TSB88-A), TIA, Arlington VA

Tompkins County Website, http://www.tompkins-co.org/

U.S. Census Bureau, State and County Quickfacts, http://quickfacts.census.gov/

APPENDIX C, GIS DATA REFERENCES

The table below summarizes the origin of the GIS datasets used to produce the figures in this report.

Data Set	Description	Source
Municipal Boundaries	Tompkins County Municipal Boundaries	Tompkins County
Land Use	High-Resolution Land Use	Tompkins County
Local Roads	Road Centerlines	Tompkins County
Buildings	Building Footprints	Tompkins County
20' Contours	20-foot Derived Contours	Tompkins County
Parcel Boundaries	Countywide Parcel Boundaries	Tompkins County
Unique Natural Areas	Areas of outstanding environmental qualities	Tompkins County
Tall Structures	Tall structure inventory	Tompkins County
Existing Towers	Existing communication towers	Tompkins County
Optimum Sites	Optimum site locations for proposed towers	Tompkins County
Proposed Towers	Proposed communication towers and antenna heights	Tompkins County
NYS Roads	NYS State Roads	NYS DOT
NYS Water	NYS Generalized Water Bodies	NYS DOT
Radio Coverage Problems	Reported radio coverage areas of concern, derived from annotated interview map	NYSTEC
Portable Coverage	Notional portable radio coverage zone, derived from city and village boundaries	NYSTEC
Transition Zone	Notional zone of transitional radio coverage, derived from a ½-mile outer buffer of the Portable coverage zone	NYSTEC
Radio Enhanced Coverage	Notional zone of radio enhanced coverage, derived as the remaining area in the county not covered by the Portable or Transition zone	NYSTEC
Aggressive Terrain	Areas of high (>20 degrees) slope and the valleys at the foot of the high-slope areas.	NYSTEC
Tactical Coverage	Areas of aggressive terrain within the Radio Enhanced Coverage zone	NYSTEC
Tompkins County DEM	DEM Mosaic compiled using NYSDEC 10-m DEMs	NYSTEC

APPENDIX D, DETAILED AGGRESSIVE TERRAIN MAPS

This appendix is a compilation of figures that show aggressive terrain, town by town. The purpose of this appendix is to allow for visual analysis of the aggressive terrain features at the town scale. There is one figure per town. These are not radio propagation maps. The proposed towers are denoted only as references. These maps depict the geophysical terrain of the towns in the County.

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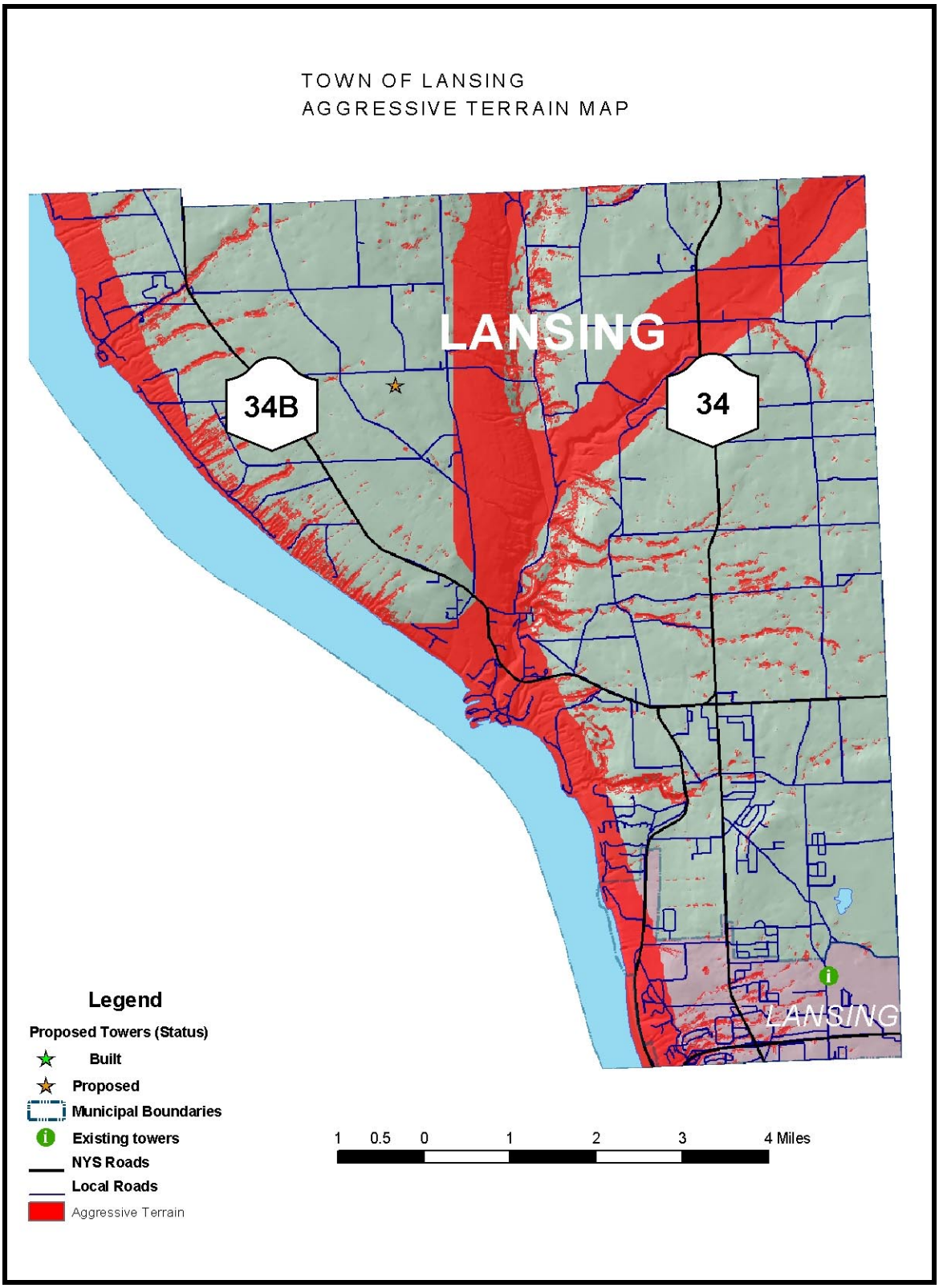
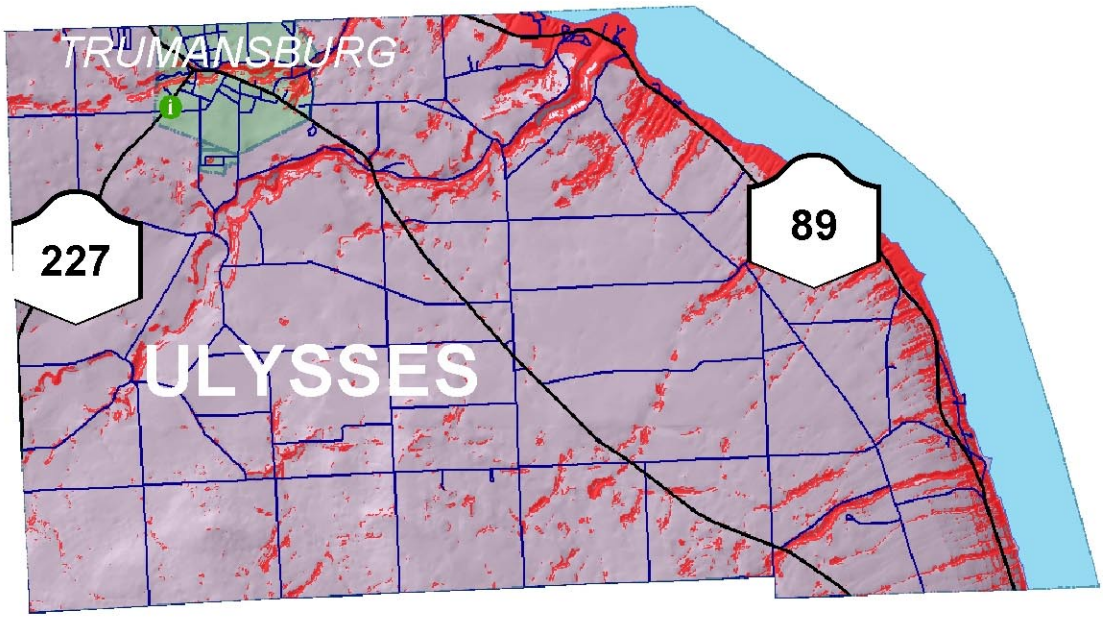


TOWN OF ULYSSES
AGGRESSIVE TERRAIN MAP

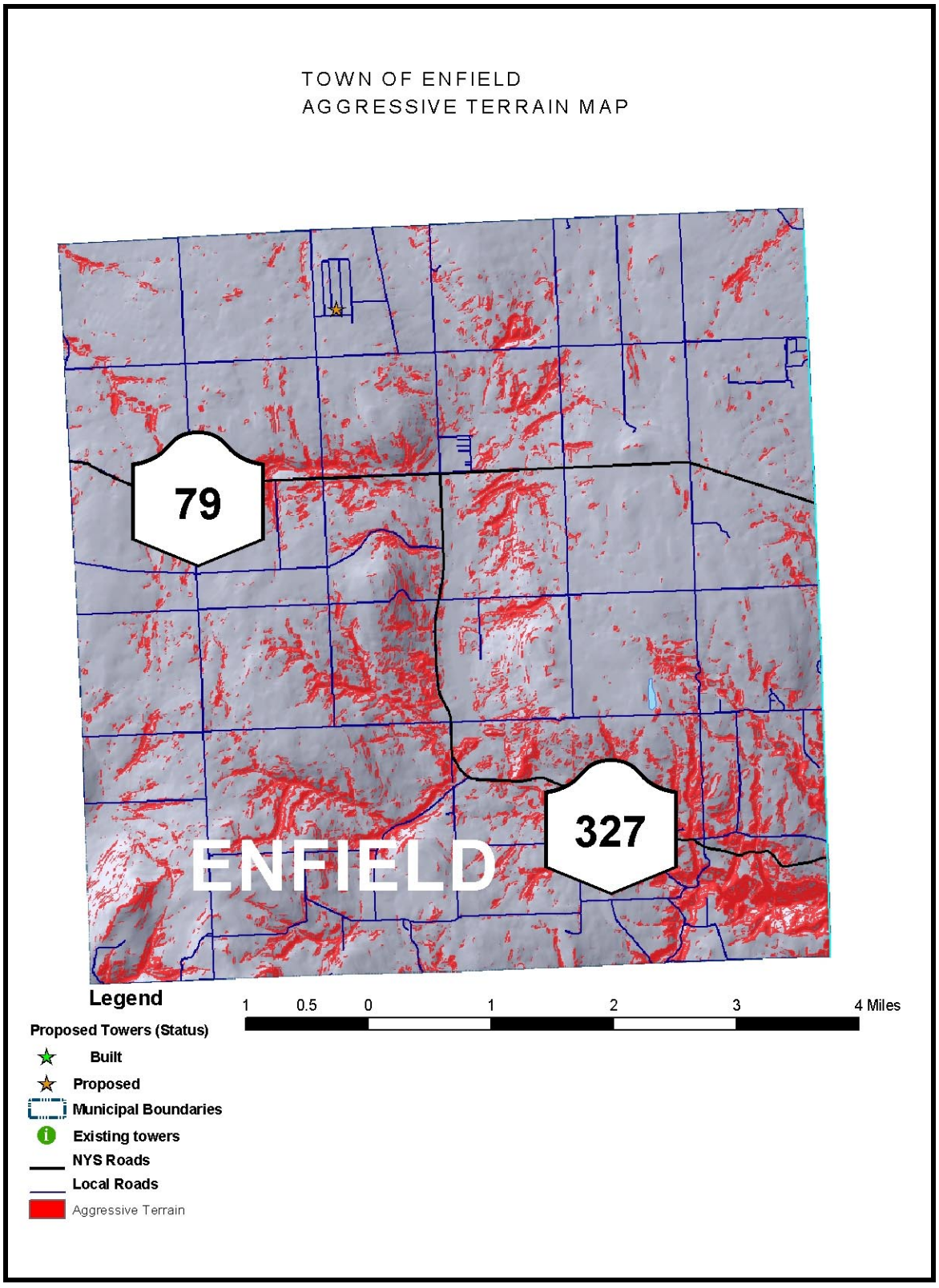


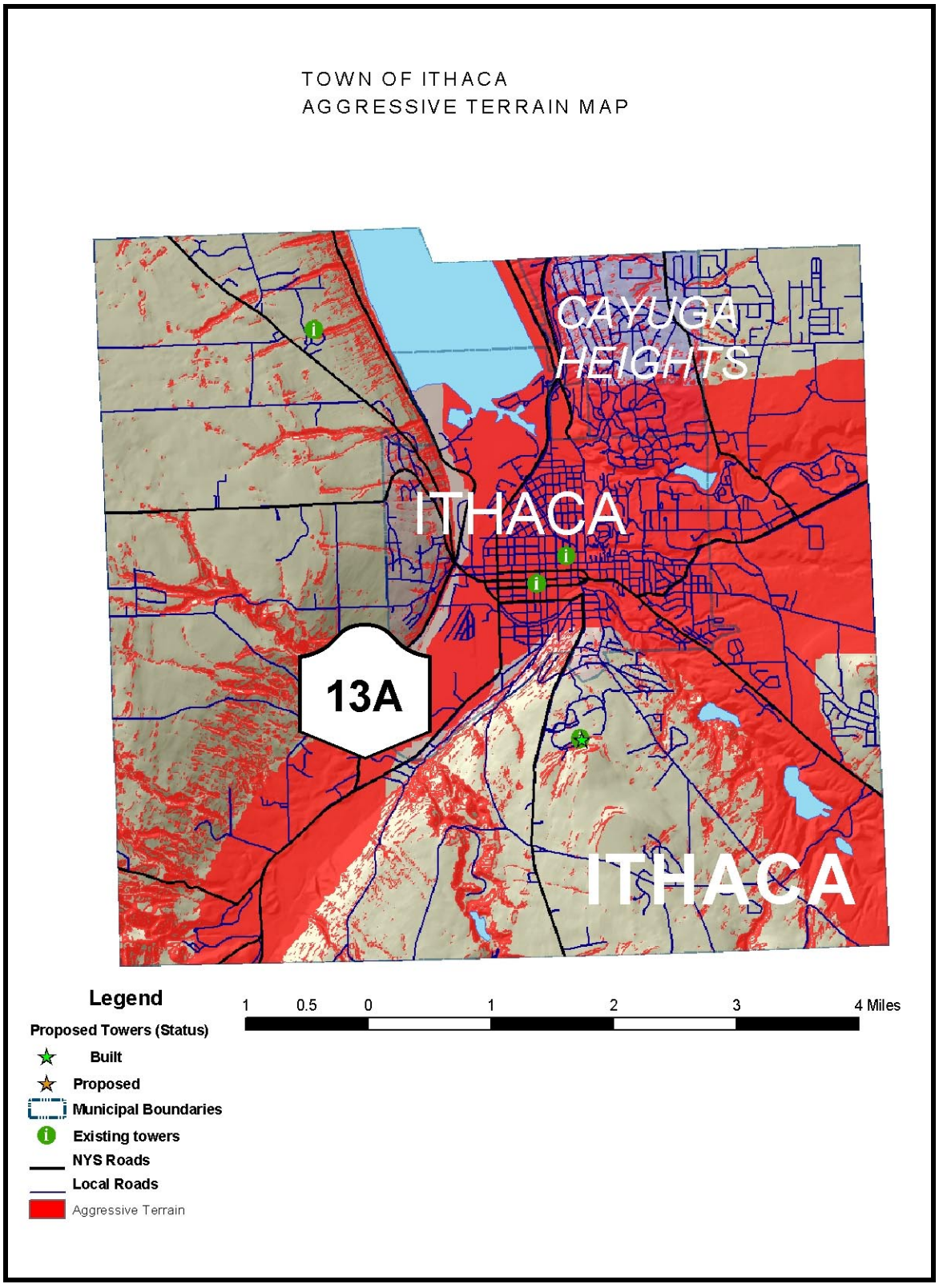
Legend

Proposed Towers (Status)

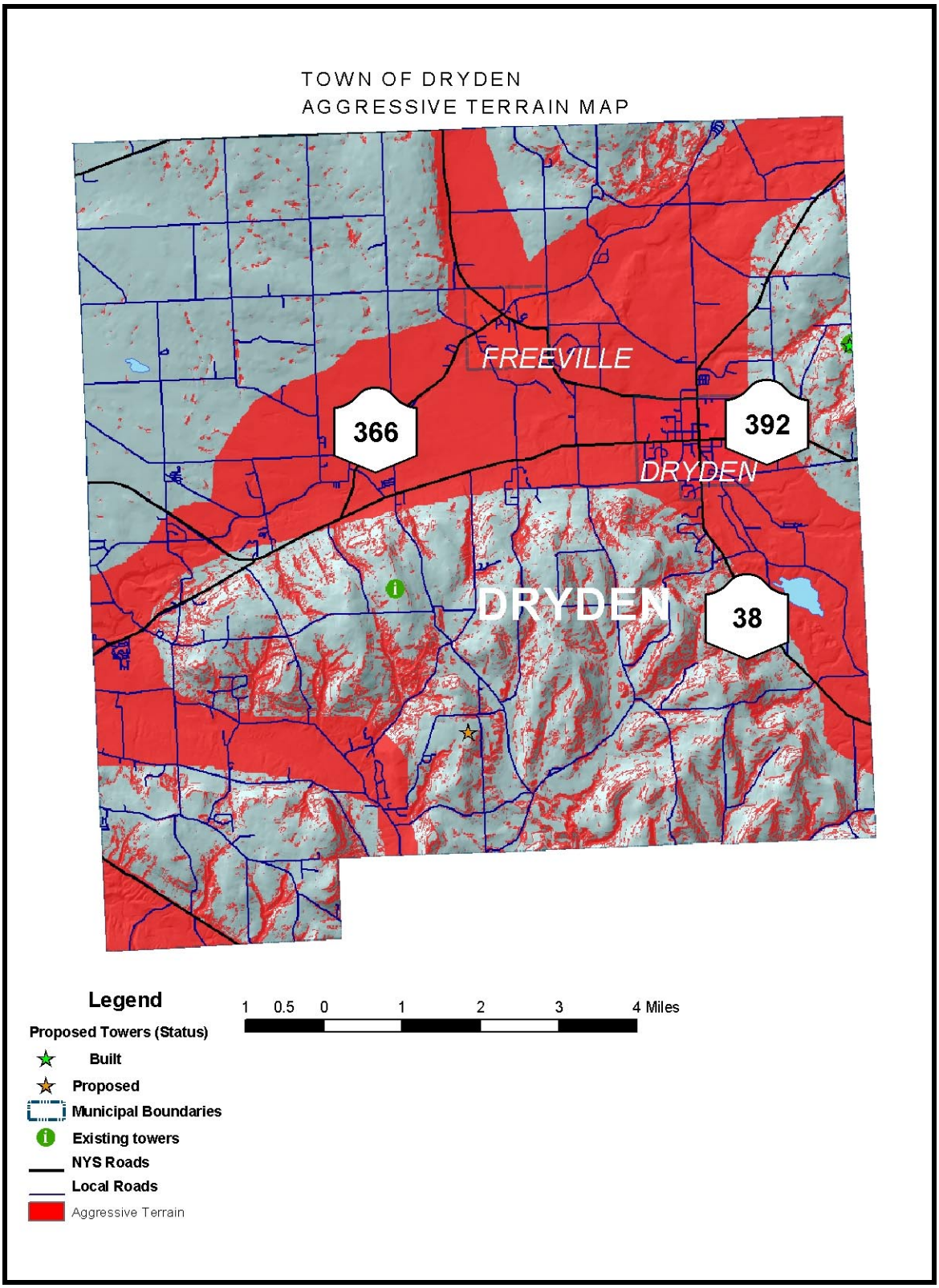
- Built
- Proposed
- Municipal Boundaries
- Existing towers
- NYS Roads
- Local Roads
- Aggressive Terrain

1 0.5 0 1 2 3 4 Miles

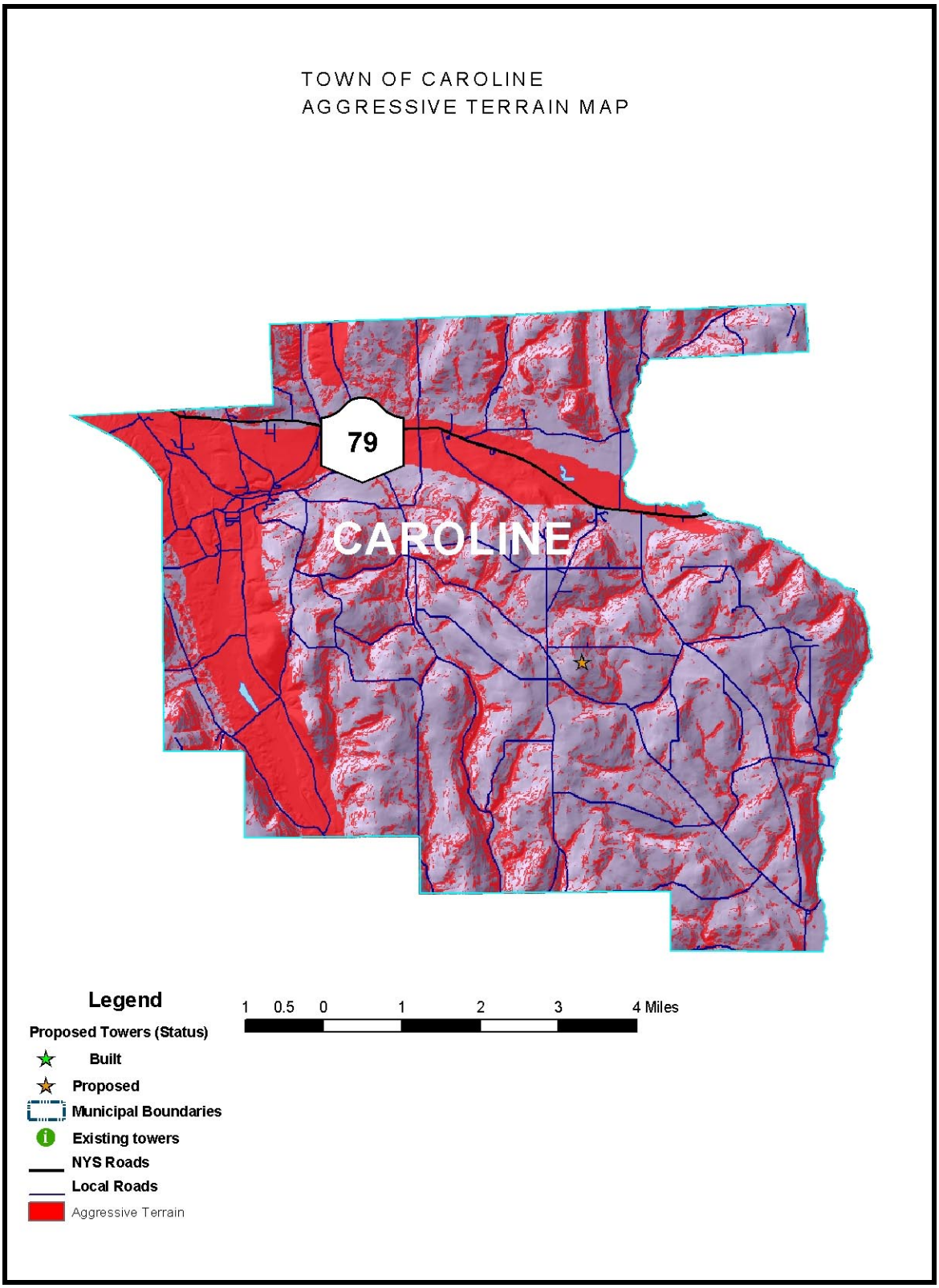

TOWN OF ENFIELD
AGGRESSIVE TERRAIN MAP
79
327
ENFIELD
Legend
Proposed Towers (Status)
Built
Proposed
Municipal Boundaries
Existing towers
NYS Roads
Local Roads
Aggressive Terrain
1 0.5 0 1 2 3 4 Miles

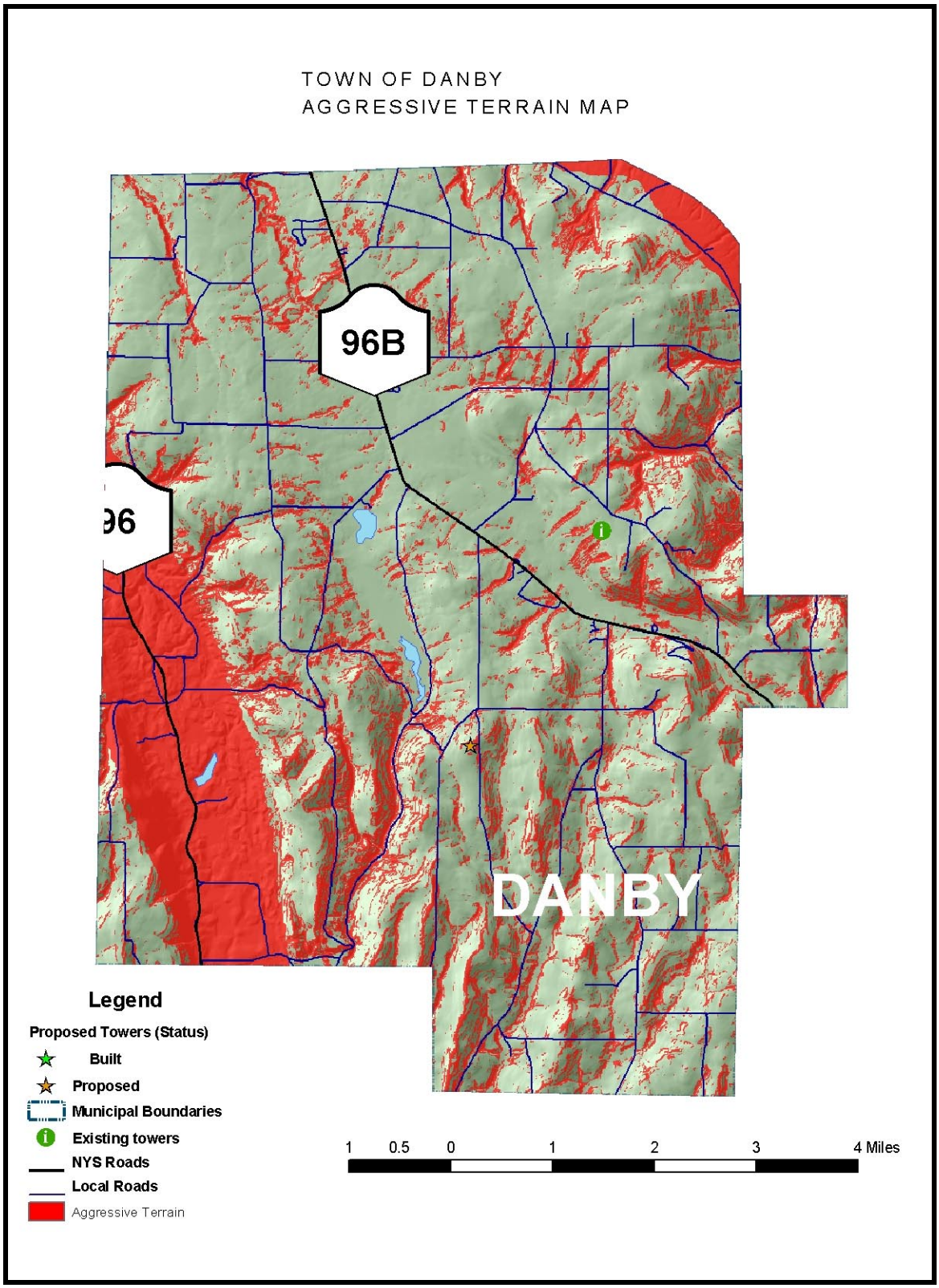

TOWN OF ITHACA
AGGRESSIVE TERRAIN MAP
CAYUGA HEIGHTS
ITHACA
13A
ITHACA
Legend
Proposed Towers (Status)
Built
Proposed
Municipal Boundaries
Existing towers
NYS Roads
Local Roads
Aggressive Terrain
1 0.5 0 1 2 3 4 Miles

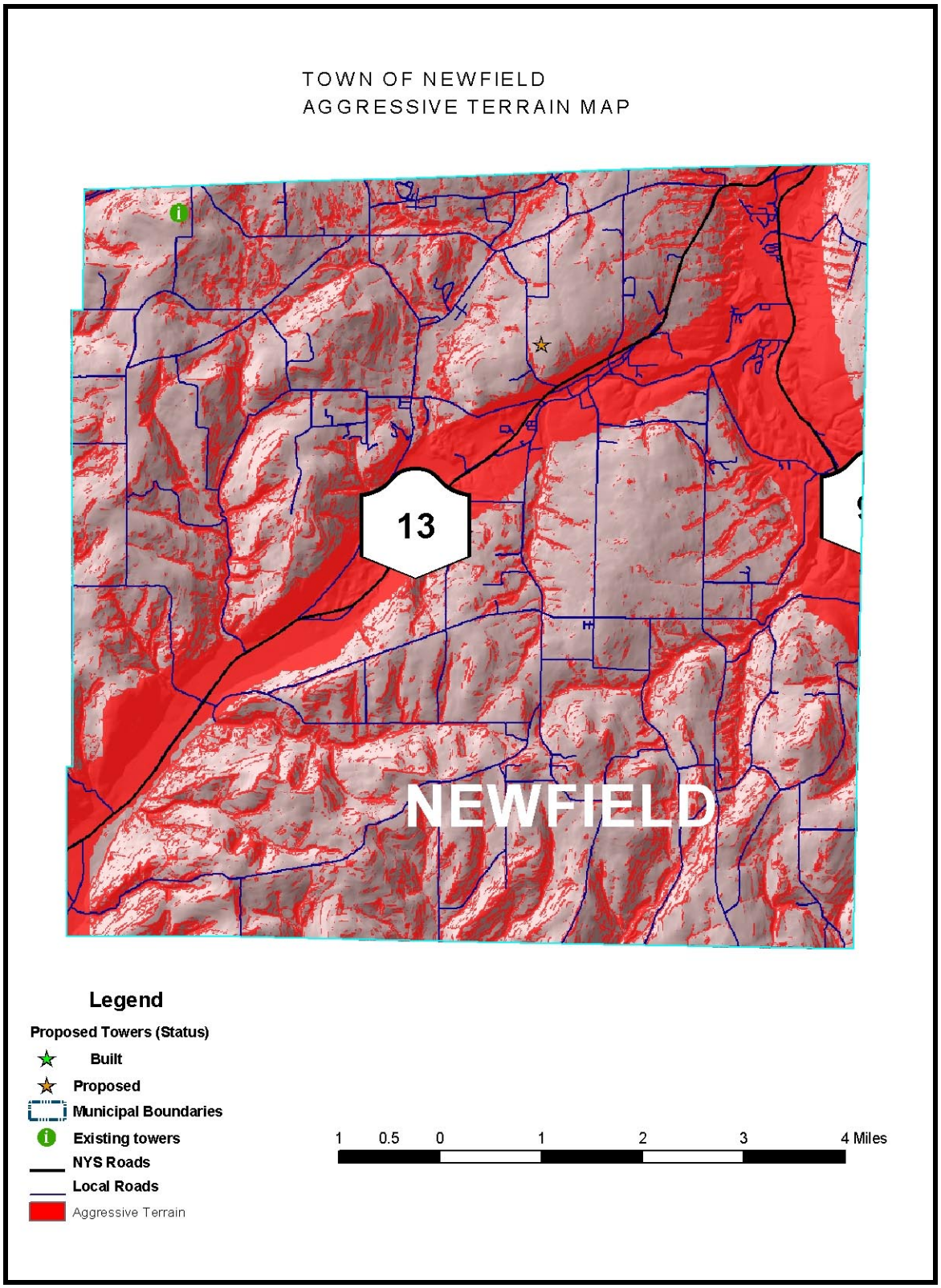
Tompkins County Radio System Project



Tompkins County Radio System Project




TOWN OF DANBY
AGGRESSIVE TERRAIN MAP
96B
96
DANBY
Legend
Proposed Towers (Status)
Built
Proposed
Municipal Boundaries
Existing towers
NYS Roads
Local Roads
Aggressive Terrain
1 0.5 0 1 2 3 4 Miles


TOWN OF NEWFIELD
AGGRESSIVE TERRAIN MAP
13
NEWFIELD
Legend
Proposed Towers (Status)
Built
Proposed
Municipal Boundaries
Existing towers
NYS Roads
Local Roads
Aggressive Terrain
1 0.5 0 1 2 3 4 Miles